

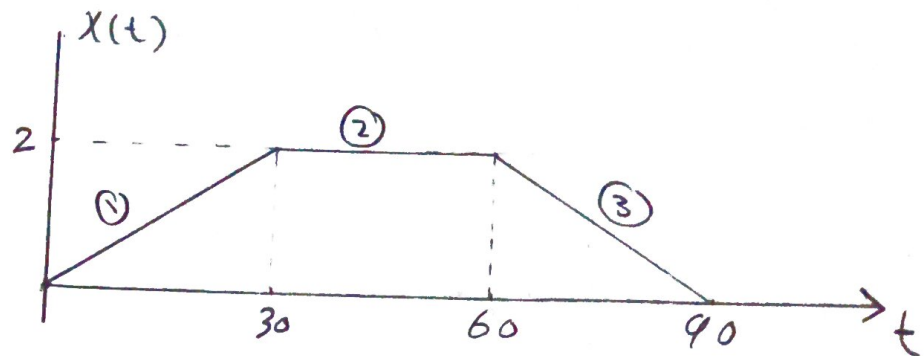
DSP

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Sec 3

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Q: Find $X(z)$, given $T=1$



Solution:-

$$\textcircled{1} x(t) = \frac{1}{15} t, [0-30] \quad \textcircled{2} x(t) = 2 [30-60]$$

$$\textcircled{3} x(t) = \frac{1}{15} (90-t) [60-90]$$

for $T=1$

$$\textcircled{1} x(n) = \frac{1}{15} n \quad \textcircled{2} x(n) = 2 \quad \textcircled{3} x(n) = \frac{1}{15} (90-n)$$

$$x(n) = \frac{1}{15} n u(n-1) u(30-n) + 2 u(n-31) u(60-n) + \frac{1}{15} u(n-61) u(90-n) (90-n)$$

$$ZT \textcircled{A} \Rightarrow \sum_{n=0}^{\infty} \frac{1}{15} n u(30-n) z^{-n} = \frac{1}{15} \sum_{n=1}^{30} n z^{-n}$$

$$ZT \textcircled{B} \Rightarrow \sum_{n=0}^{\infty} 2 u(n-31) u(60-n) z^{-n} = 2 \sum_{n=31}^{60} z^{-n}$$

$$ZT \textcircled{C} \Rightarrow \sum_{n=0}^{\infty} \frac{1}{15} u(n-61) u(90-n) (90-n) z^{-n} = \frac{1}{15} \sum_{n=61}^{89} (90-n) z^{-n}$$

$$\therefore X(z) = \frac{1}{15} \left[\sum_{n=1}^{30} n z^{-n} + \sum_{n=61}^{89} (90-n) z^{-n} \right] + 2 \sum_{n=31}^{60} z^{-n}$$